

# Generation of Melodious tunes using CNN and Genetic Algorithm

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## ABSTRACT

Most of us likes to listen songs and some the people also likes to sing song but while singing song if the person gets the help of music then it will create more interest. It is not necessary that we have to be a music expert to generate music. Even a person not having a knowledge of music can generate decent quality of music. We all like to listen music and if any method can generate music automatically then it will bring great evolution in music industry. There has been a lot of interest lately to carry out creative pursuits in visual and music art forms using deep learning. Project magenta from google is an excellent example. We propose system for creating melodious tunes using Genetic algorithm and CNN.

**Keywords—** Convolutional Neural Network (CNN), Genetic Algorithm, Long Short Term Memory(LSTM)

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## I. INTRODUCTION

Music is one of the most broadly utilized sign streams. It very well may be used in numerous applications. Musicians or artists develop on what is produced by machine and give their unique work. The music or art produced by machine or software is likewise sold by organizations or people who propose them. A case of this is Aiva, an Artificial Intelligence music generator which has just released its own copyrighted album loaded up with created sound tracks. Automating is the imaginative procedure of person implies that businesses can get mixed media items before and effortlessly. That is the reason music generator is a significant application in AI methods. Music is divided into various categories in different ways such as, religious music, popular music, secular music, art music. The music is composition of tunes, lyrics, vocal music, instruments. Various parameters are considered while creating music such as tempo, pitch, duration, loudness etc.

Notes are building obstruct for all music. The melodic letter sets comprises of seven letters: A,B,C,D,E,F,G. Each note has one of a kind pitch. There are 12 notes on piano console. The white keys on the console play common notes in scale(A,B,C,D,E,F,G). Playing just white keys place you in either the key of C major or A minor. The dark keys on console play level and sharp

notes in a scale. Playing mix of white and dark enable you to write in all accessible keys signature.

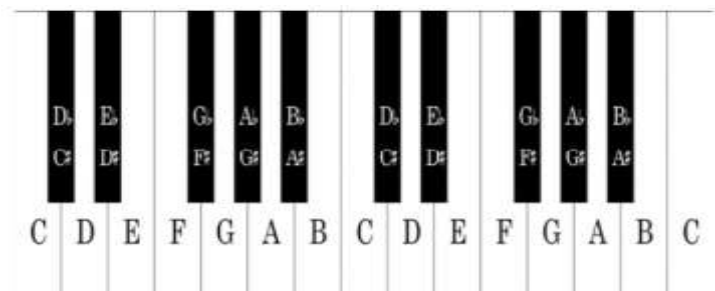


Fig. 1 western piano notes

Convolutional Neural Network is a particular kind of Artificial neural network that utilizes perceptrons, a Machine Learning algorithms, for supervised learning, to analyse information. CNN apply to image processing, Natural Language Processing and different sorts of cognitive works. We extend the application of CNN for creating music.

## II. LITERATURE SURVEY

### 1. Music Recommendation using collaborative filtering and Deep learning

Authors in their proposed paper [1] introduced concept of filtering out songs based on the interest of user. Their approach is to enhance the Recommended system by

combining the filtering technique with deep learning. They have used traditional filtering techniques and use the album art of the song to recommend new song.

## 2. Music composition using Recurrent Neural Network

Author proposed [2] generative RNN models that will create music sheet with well known structure without predefining rules of music composition initially character RNN's were able to learn some patterns but not create structurally accurate music.

## 3. Music generation based on Convolutional – Long Short Term Memory (LSTM)

In[3] paper, author proposed a model that combines CNN and LSTM for music generation. MIDI – format music file is first converted into musical score matrix. Output of convolutional layer is split in the direction of time axis and input into LSTM. The frequency of the song generated by the LSTM is not sufficiently concentrated hence it moved to CLSTM.

## 4. Polyphonic music generation with sequence generative adversarial networks

In[4] paper, author proposed an application of Sequence GAN which are GAN for creating polyphonic melodious music sequence. The training of GAN is not more computationally efficient than neural network training.

## 5. MIDINET: A convolutional generative adversarial network for symbolic- domain music generation

Author proposed [5] a model, which will generate melodious tunes. In addition to this, they have used a discriminator to learn the distributions of melodies, and make it GAN.

## 6. Music generation with local connected convolution neural network

In[6] paper, local connected convolutional layers are added to plain CNN. Which will boost the CNN model to generate better music than that of RNN and naïve CNN model.

## 7. Automatic instrument recognition in polyphonic music using convolutional neural network

In[7] paper, author proposed a model for feature extraction and learning algorithms are trained together to generate music.

## 8. Music composition with Deep Learning

In[8] paper, model is proposed to generate music using deep learning

### III. METHODOLOGY

#### A. Convolutional Neural Network

Convolutional Neural Network also called as ConvNet or CNN are used in deep learning for mapping input data to the output variable. CNN's are very efficient in the various fields such as image classification and recognition. Various applications of CNN are:

1. Medical image analysis

2. Image recognition
3. Video recognition natural language processing
4. Recommender system

Architecture of CNN is as follows:

It consist of three layers: Input layer, Hidden layer and Output layer.

**Input Layer:** The input layer collects the information from the outside world and provides to the neural network for further processing. The output of the input layer is given to the hidden layer. The network is having only one input layer.

**Hidden Layer:** The hidden layer is responsible for performing various calculations and transferring information from input layer to output layer. The network can have multiple hidden layers.

**Output Layer:** Output layer can also perform the calculations and transfer the information from network to the outside world. The network is having only one output layer.

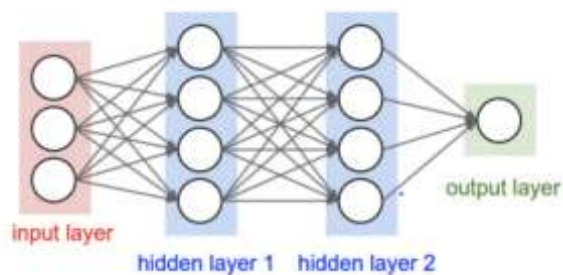


Fig. 2 CNN architecture

CNN supports regularization by following different strategies. In Fully Connected Neural networks each element of previous layer is responsible for transferring data to next layer whereas in CNN input for next layer is received from restricted sub-area, which is called as "Receptive field".

#### B. Genetic Algorithm :-

Genetic algorithm is optimization technique that imitates the procedure of natural evaluation. The principle of natural selection is that, Select best and discard next. The genetic algorithm can address issues of combined entire number programming, where a couple of sections are constrained to be number regarded. In every iteration genetic algorithm selects parents based on fitness function and use these parent to generate population for next generation. The genetic algorithm uses three essential sorts of models at every iteration to make the front line from the present people:

- Selection rules select the individuals, called parents, that add to the population at the individuals to come.
- Crossover standards combine two parents to outline solutions for the individuals to come.

- Mutation standards apply unpredictable changes to singular parents to shape solutions. It is the process of introducing new feature into the solutions of population for maintaining diversity.

The basic structure of population, chromosome, genes are as shown in figure.

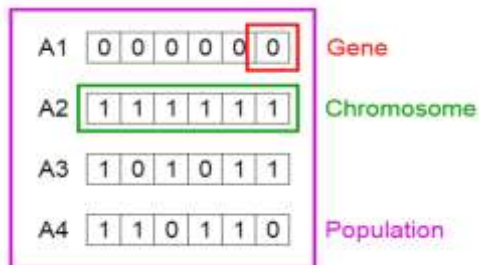


Fig. 3 structure of population in genetic algorithm

**IV. PROPOSED SYSTEM**

The project consist of two parts, first is melodious tune prediction and second is tune generation. In the first part, database has two parts which are random and melodious tunes. The random tunes will be generated by random tune generator program in java. The ratings to this tune will be given manually. And also rating to the melodious tunes will be given. The data is transformed to numerical content. And it provides as a input to Neural network which will predict whether tune is melodious or not. In the second part, we will filter unwanted tunes and using Genetic algorithms we will create melodious tune from set of existing tunes.

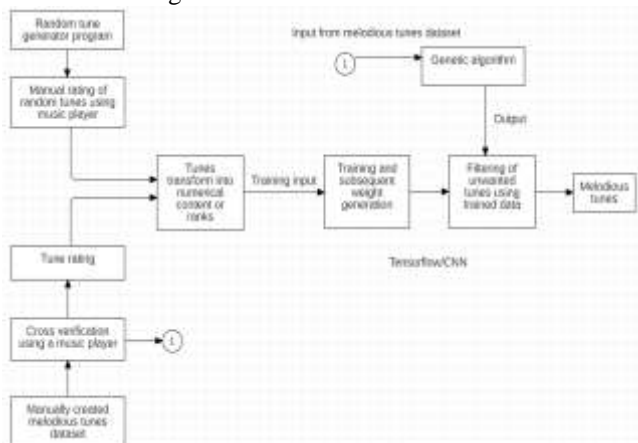


Fig. 4 proposed system

**V. EXPECTED RESULT**

The network will able to generate melodious tunes from already available tune present in dataset.

Dataset consists of melodious tunes and randomly generated tunes. The first phase of the project will able to generate the random tunes as shown in below figure:

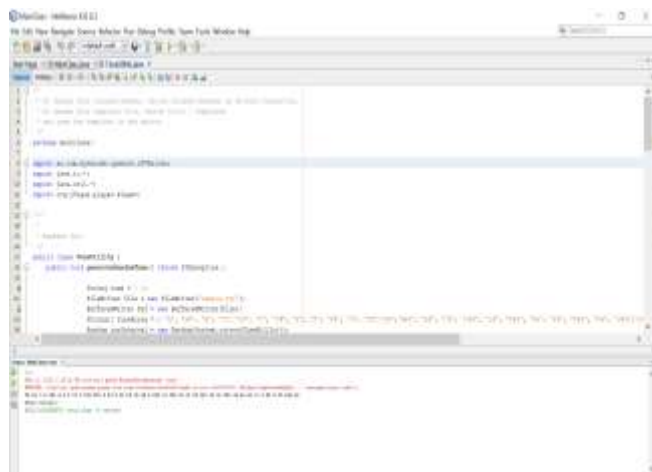


Fig. 5 sample output

In second phase of the project we are considering the dataset which consists of random tunes and melodious tunes for training neural network. we will going to provide output of first phase for training. And using the genetic algorithm network will generate melodious tunes. We are expecting ~90% of accuracy.

**VI. CONCLUSION**

The end result should be showing the prediction of melodious tunes and generation of tunes from already available tunes. This project will be helpful to reduce human load as tunes will be generated by machine. Also, the accuracy, sensitivity, specificity of the proposed system is high. In future, tunes with time interval and more notes can be generated hence the accuracy of system could be improved.

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